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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,415	03/26/2004	Liang Liu		2618

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EXAMINER	
RIELLEY, ELIZABETH A	

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 09/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/811,415	LIU ET AL.	
	Examiner	Art Unit	
	Elizabeth A. Rielley	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Amendment filed 6/27/06 has been entered and considered by the Examiner. Currently, claims 1-16 are pending in the instant application.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/27/06 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1. 3-5, 13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al (US 20030027478) in view of Applicant's admitted prior art.

In regard to claim 1, Park et al ('478) teaches a method for making a carbon nanotube based field emission device (figure 3d; abstract) comprising the steps of: providing a substrate having a flat surface (18; figure 3b; paragraph 27); forming a carbon nanotube array extending from the selected area by a growth method (17; paragraph 28; claim 2), the carbon nanotube array having a flat bottom surface corresponding to the flat surface of the substrate (see figure 3b); forming a cathode electron on a top of the carbon nanotube array (2 via 15; paragraphs 25 and 29); and removing the substrate so as to expose the flat bottom surface of the carbon nanotube array so that the flat bottom surface of the carbon nanotube array is thereby configured for acting as an electron emitting surface of the carbon nanotube based FED (figure 3c; paragraph 31). Park et al ('478) is silent regarding the limitation of growing the carbon nanotubes on the substrate using a catalyst. The Applicant, however, states that growing CNT by depositing a catalyst on a substrate is known in the art in order to produce CNTs of various heights (paragraph 3 of Applicant's specification). The MPEP states that "[w]here the specification identifies work done by another as "prior art," the subject matter so identified is treated as admitted prior art. In re Nomiya, 509 F.2d 566, 571, 184 USPQ 607, 611 (CCPA 1975). Thus, it would have been obvious at the time of the invention to one of ordinary skill in the art to incorporate the method of forming CNTs using a catalyst as taught by Applicant's admitted art with the method of manufacturing a FED as taught by Park et al. Motivation for combining would be produce CNTs of various heights.

In regard to claim 13, Park et al ('478) teaches a method for making a carbon nanotube based field emission device (figure 3d; abstract) comprising the steps of: providing a substrate having a flat surface (18; figure 3b; paragraph 27); forming a carbon nanotube array extending from the selected area by a growth method (17; paragraph 28; claim 2), the carbon nanotube array having a flat bottom surface corresponding to the flat surface of the substrate (see figure 3b); forming a layer of metallic material on a top of the carbon nanotube array (2 via 15; paragraphs 26 and 29); and removing the substrate so as to

expose the flat bottom surface of the carbon nanotube array so that the flat bottom surface of the carbon nanotube array is thereby configured for acting as an electron emitting surface of the carbon nanotube based FED (figure 3c; paragraph 31). Park et al ('478) is silent regarding the limitation of growing the carbon nanotubes on an insulative substrate. The Applicant, however, states that growing CNT on an insulative substrate is known in the art (paragraphs 3 and 40). The MPEP states that "[w]here the specification identifies work done by another as "prior art," the subject matter so identified is treated as admitted prior art. In re Nomiya, 509 F.2d 566, 571, 184 USPQ 607, 611 (CCPA 1975). Thus, it would have been obvious at the time of the invention to one of ordinary skill in the art to incorporate the method of forming CNTs on an insulating substrate as taught by Applicant's admitted art with the method of manufacturing a FED as taught by Park et al. Motivation for combining would be to use appropriate material for the substrate (paragraph 40).

In regard to claims 3 and 15, Applicants continues to teach in their prior art that the substrate is made of heatproof glass, silicon, or silicon oxide (paragraph 3) in order to use the appropriate material for the substrate.

In regard to claims 4 and 5, Applicants continues to teach in their prior art that the substrate is commonly in a thickness of 1 to 1000 microns and 10 to 200 microns in order to grow CNTs (paragraph 28).

Claims 2, 14, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al (US 20030027478) in view of Applicant's admitted prior art in further view of Mirkin et al (US 20030049381).

Park/Applicant's admitted prior art teach all the limitations set forth, as described above, except a variation in flatness of the surface of the substrate is less than 1 micron and the surface is polished with great flatness. In the same field of endeavor of insulating substrates, Mirkin et al teach an insulating substrate that has a variation in flatness of the surface of the substrate is less than 1 micron (paragraph 142) and the surface is polished with great flatness (paragraph 177). One skilled in the art would reasonably contemplate modifying the device of Park/admitted art to include the claimed substrate qualities, as an obvious matter of design engineering as evidenced by Mirkin ('381). Applicant's claimed material does not provide unexpected results that are not within the teaching applied, since both the substrates disclosed in Park and the admitted art as well as the substrate disclose by the Applicant perform the same function of growing carbon nanotubes. Thus, it would have been obvious at the time of the invention to one of ordinary skill in the art to combine the substrate of Mirkin with the FED manufacturing method as taught by Park and applicant's admitted prior art. Motivation to combine would be to grow CNTs on a substrate.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al (US 20030027478) in view of Applicant's admitted prior art in further view of Dai et al (US 6232706).

Park/Applicant's admitted prior art teach all the limitations set forth, as described above, except a thickness of the catalyst layer is in the range from 1 nanometer to 10 nanometers. In the same field of endeavor, Dai et al ('706) teaches a method of manufacturing CNTs wherein a thickness of a catalyst layer for growing CNTs is in the range from 1 nanometer to 10 nanometers (column 3 lines 5-18 and 55-59) in order to properly grow CNTs (column 3 lines 55-59).

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al (US 20030027478) in view of Applicant's admitted prior art in further view Hsu (US 20020042241).

Park/Applicant's admitted prior art teach all the limitations set forth, as described above, except the substrate is removed by etching process. However, one skilled in the art would reasonably contemplate modifying this device of to include the claimed limitation of etching the substrate, as an obvious matter of design engineering as evidenced by Hsu ('241; paragraph 66). Applicant's claimed material does not provide unexpected results that are not within the teaching applied, since both the method of forming a substrate disclosed in Park and the Prior Art as well as the etching away of a substrate method disclose by the Applicant perform the same function of removing the substrate. Thus, it would have been obvious at the time of the invention to one of ordinary skill in the art to combine the method of etching away a substrate of Hsu with the removal of the substrate as taught by Park and Applicant. Motivation to combine would be to remove the substrate from the CNTs.

Claims 8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al (US 20030027478) in view of Mirkin et al (US 20030049381).

In regard to claim 8, Park et al ('478) teaches a method for making a carbon nanotube based field emission device (figure 3d; abstract) comprising the steps of: providing a substrate having a flat surface (18; figure 3b; paragraph 27); forming a carbon nanotube array extending from the selected area by a growth method (17; paragraph 28; claim 2), the carbon nanotube array having a flat bottom surface corresponding to the flat surface of the substrate (see figure 3b); forming a cathode electron on a top of the carbon nanotube array (2 via 15; paragraphs 25 and 29); and removing the substrate so as to expose the flat bottom surface of the carbon nanotube array so that the flat bottom surface of the carbon nanotube array is thereby configured for acting as an electron emitting surface of the carbon nanotube

based FED (figure 3c; paragraph 31). Park et al ('478) is silent regarding the limitation of the substrate having a surface that has a variation in flatness of less than 1 micron. In the same field of endeavor of substrates, Mirkin et al teach an insulating substrate that has a variation in flatness of the surface of the substrate is less than 1 micron (paragraph 142). One skilled in the art would reasonably contemplate modifying the device of Park/admitted art to include the claimed substrate qualities, as an obvious matter of design engineering as evidenced by Mirkin ('381). Applicant's claimed material does not provide unexpected results that are not within the teaching applied, since both the substrates disclosed in Park and the admitted art as well as the substrate disclose by the Applicant perform the same function of growing carbon nanotubes. Thus, it would have been obvious at the time of the invention to one of ordinary skill in the art to combine the substrate of Mirkin with the FED manufacturing method as taught by Park and applicant's admitted prior art. Motivation to combine would be to grow CNTs on substrate.

In regard to claim 12, Park et al ('478) teaches at least one gate electrode (4 paragraph 23) adjacent to the CNT array (figure 3d).

Claims 9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al (US 20030027478) in view of Mirkin et al (US 20030049381) and in further view of Applicant's admitted prior art.

In regard to claim 9, Park/Mirkin teach all the limitations set forth, as described above, except that the CRTs are formed by a chemical vapor deposition process. The Applicant, however, states that growing CNT by CVD is known in the art in order to produce CNTs of various heights (paragraph 3 of Applicant's specification). The MPEP states that "[w]here the specification identifies work done by

another as "prior art," the subject matter so identified is treated as admitted prior art. In re Nomiya, 509 F.2d 566, 571, 184 USPQ 607, 611 (CCPA 1975). Thus, it would have been obvious at the time of the invention to one of ordinary skill in the art to incorporate the method of forming CNTs by CVD as taught by Applicant's admitted art with the method of manufacturing a FED as taught by Park et al. Motivation for combining would be produce CNTs of various heights.

In regard to claim 11, Park/Mirkin teach all the limitations set forth, as described above, except that the substrate is made of heatproof glass, silicon, or silicon oxide. Applicants continues to teach in their prior art that the substrate is made of heatproof glass, silicon, or silicon oxide (paragraph 3) in order to use the appropriate material for the substrate.

Claim 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al (US 20030027478) in view of Mirkin et al (US 20030049381) and in further view of Smalley et al (US 6183714).

Park/Mirkin teach all the limitations set forth, as described above, except the carbon nanotube array is treated by laser irradiation to clean the surface thereof. Smalley et al ('714) teach of a carbon nanotube array that is treated by laser irradiation to clean the surface thereof (column 14 lines 55-67). Hence, it would have been obvious at the time of the invention to one of ordinary skill in the art to modify the method of manufacturing a carbon nanotube array, as taught by Park/Mirkin with the laser cleaning by Smalley. Motivation to combine would be to have a clean carbon nanotube.

Response to Arguments

Applicant's arguments with respect to claims 1-16 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US PGPub 20040150311 teach the need for a flat substrate to grow CNTs thereon.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth A. Rielley whose telephone number is 571-272-2117. The examiner can normally be reached on Monday - Friday 7:30 - 4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar Patel can be reached on 571-272-2457. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-

direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Elizabeth Rielley

Examiner
Art Unit 2879

S. Roy
9/1/06
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